CLAIMS

1. A method for forming light-olefins from an oxygenate-containing feedstock, comprising:
directing the feedstock through a feed introduction nozzle attached to an MTO reactor and having an inner surface, at least a portion of which is formed of a first material that is resistant to the formation of metal catalyzed side reaction byproducts; and
contacting, in the reactor, the feedstock with a catalyst under conditions effective to form an effluent comprising the light olefins.

2. The method of claim 1, wherein the nozzle is formed, at least in part, of the first material.

3. The method of claim 2, wherein the first material is an alloy selected from the group consisting of 410, 304, 316, 400, 330, 800, 600, 825, 601, 625, 617, 956, 693 and 671.

4. The method of claim 2, wherein the first material comprises at least 20 weight percent chromium.

5. The method of claim 4, wherein the first material comprises at least 25 weight percent chromium.

6. The method of claim 5, wherein the first material comprises at least 30 weight percent chromium.

7. The method of claim 6, wherein the first material comprises at least 40 weight percent chromium.

8. The method of claim 2, wherein the first material comprises at least 10 weight percent nickel.

9. The method of claim 8, wherein the first material comprises at least 30 weight percent nickel.

10. The method of claim 9, wherein the first material comprises at least 50 weight percent nickel.

11. The method of claim 10, wherein the first material comprises at least 60 weight percent nickel.

12. The method of claim 2, wherein the first material comprises at least 2 weight percent aluminum.

13. The method of claim 12, wherein the first material comprises at least 4 weight percent aluminum.

14. The method of claim 2, wherein the first material comprises less than 70 weight percent iron.

15. The method of claim 14, wherein the first material comprises less than 50 weight percent iron.

16. The method of claim 15, wherein the first material comprises less than 30 weight percent iron.

17. The method of claim 16, wherein the first material comprises less than 10 weight percent iron.

18. The method of claim 17, wherein the first material comprises less than 5 weight percent iron.

19. The method of claim 1, wherein the feed introduction nozzle comprises an inner coating layer forming the inner surface, the coating layer being formed, at least in part, of the first material.

20. The method of claim 19, wherein the first material comprises at least 20 weight percent chromium.

21. The method of claim 20, wherein the first material comprises at least 25 weight percent chromium.

22. The method of claim 21, wherein the first material comprises at least 30 weight percent chromium.

23. The method of claim 22, wherein the first material comprises at least 40 weight percent chromium.

24. The method of claim 19, wherein the first material comprises at least 10 weight percent nickel.

25. The method of claim 24, wherein the first material comprises at least 30 weight percent nickel.

26. The method of claim 25, wherein the first material comprises at least 50 weight percent nickel.

27. The method of claim 26, wherein the first material comprises at least 60 weight percent nickel.

28. The method of claim 19, wherein the first material comprises at least 2 weight percent aluminum.

29. The method of claim 28, wherein the first material comprises at least 4 weight percent aluminum.

30. The method of claim 19, wherein the first material comprises less than 70 weight percent iron.

31. The method of claim 30, wherein the first material comprises less than 50 weight percent iron.

32. The method of claim 31, wherein the first material comprises less than 30 weight percent iron.

33. The method of claim 32, wherein the first material comprises less than 10 weight percent iron.

34. The method of claim 33, wherein the first material comprises less than 5 weight percent iron.

35. The method of claim 19, wherein the first material is any material other than carbon steel.

36. The method of claim 1, further comprising:
maintaining the inner surface of the nozzle at a temperature below 400°C.

37. The method of claim 36, wherein the inner surface of the nozzle is maintained at a temperature below 300°C.

38. The method of claim 37, wherein the inner surface of the nozzle is maintained at a temperature below 200°C.

39. The method of claim 1, wherein the inner surface of the nozzle is maintained at a temperature above 500°C.

40. The method of claim 39, wherein the inner surface of the nozzle is maintained at a temperature above 650°C.

41. The method of claim 36, further comprising:
cooling at least a portion of the inner surface of the nozzle with a cooling system.

42. The method of claim 36, wherein the nozzle is jacketed with a thermally insulating material.

43. The method of claim 42, wherein the insulating material is selected from the group consisting of fire brick, high temperature calcium silicate, alumina and silica-alumina ceramics, diatomaceous silica brick and cements, and fillers.

44. The method of claim 42, wherein the thermally insulating material covers at least a portion of an interior portion of the nozzle extending inside the MTO reactor.

45. The method of claim 1, further comprising:
maintaining the feedstock below 400°C while the feedstock is in the nozzle.

46. The method of claim 45, wherein the feedstock is maintained below 350°C while the feedstock is in the nozzle.

47. The method of claim 46, wherein the feedstock is maintained below 250°C while the feedstock is in the nozzle.

48. The method of claim 47, wherein the feedstock is maintained below 200°C while the feedstock is in the nozzle.

49. The method of claim 1, wherein the feedstock is superheated while the feedstock is in the nozzle.

50. The method of claim 1, further comprising:
maintaining the nozzle at conditions effective to produce less than 0.8 weight percent of metal catalyzed side reaction byproducts excluding CO, CO_2 and H_2.

51. The method of claim 50, wherein the conditions are effective to produce less than 0.4 weight percent of metal catalyzed side reaction byproducts excluding CO, CO_2 and H_2.

52. The method of claim 51, wherein the conditions are effective to substantially eliminate the formation of metal catalyzed side reaction byproducts.

53. The method of claim 1, wherein the first material is an alloy selected from the group consisting of TD, 758, 625, 601 and 276.

54. The method of claim 1, wherein the first material is an alloy selected from the group consisting of 693, 602, 690, 671, 617, 263 and 956.

55. The method of claim 2, wherein the first material comprises at least two weight percent copper.

56. The method of claim 55, wherein the first material comprises at least 15 weight percent copper.

57. The method of claim 56, wherein the first material comprises at least 35 weight percent copper.

58. The method of claim 2, wherein the first material is an alloy selected from the group consisting of 825 and 400.

59. A feed vaporization and introduction system for an MTO reactor, comprising:

a feed introduction nozzle including a first generally tubular member having a first end for receiving a feedstock from a heating unit, a second end adjacent a reactor unit, and an inner surface forming a conduit for delivering the feedstock from the first end to the second end, wherein at least a portion of the inner surface is formed of a first material that is resistant to the formation of metal catalyzed side reaction byproducts.

60. The feed vaporization and introduction system of claim 59, wherein the nozzle is formed, at least in part, of the first material.

61. The feed vaporization and introduction system of claim 60, wherein the first material is an alloy selected from the group consisting of 410, 304, 316, 400, 330, 800, 600, 825, 601, 625, 617, 956, 693 and 671.

62. The feed vaporization and introduction system of claim 60, wherein the first material comprises at least 20 weight percent chromium.

63. The feed vaporization and introduction system of claim 62, wherein the first material comprises at least 25 weight percent chromium.

64. The feed vaporization and introduction system of claim 63, wherein the first material comprises at least 30 weight percent chromium.

65. The feed vaporization and introduction system of claim 64, wherein the first material comprises at least 40 weight percent chromium.

66. The feed vaporization and introduction system of claim 60, wherein the first material comprises at least 10 weight percent nickel.

67. The feed vaporization and introduction system of claim 66, wherein the first material comprises at least 30 weight percent nickel.

68. The feed vaporization and introduction system of claim 67, wherein the first material comprises at least 50 weight percent nickel.

69. The feed vaporization and introduction system of claim 68, wherein the first material comprises at least 60 weight percent nickel.

70. The feed vaporization and introduction system of claim 60, wherein the first material comprises at least 2 weight percent aluminum.

71. The feed vaporization and introduction system of claim 70, wherein the first material comprises at least 4 weight percent aluminum.

72. The feed vaporization and introduction system of claim 60, wherein the first material comprises less than 70 weight percent iron.

73. The feed vaporization and introduction system of claim 72, wherein the first material comprises less than 50 weight percent iron.

74. The feed vaporization and introduction system of claim 73, wherein the first material comprises less than 30 weight percent iron.

75. The feed vaporization and introduction system of claim 74, wherein the first material comprises less than 10 weight percent iron.

76. The feed vaporization and introduction system of claim 75, wherein the first material comprises less than 5 weight percent iron.

77. The feed vaporization and introduction system of claim 59, wherein the feed introduction nozzle comprises an inner coating layer forming the inner surface, the coating layer being formed, at least in part, of the first material.

78. The feed vaporization and introduction system of claim 77, wherein the first material comprises at least 20 weight percent chromium.

79. The feed vaporization and introduction system of claim 78, wherein the first material comprises at least 25 weight percent chromium.

80. The feed vaporization and introduction system of claim 79, wherein the first material comprises at least 30 weight percent chromium.

81. The feed vaporization and introduction system of claim 80, wherein the first material comprises at least 40 weight percent chromium.

82. The feed vaporization and introduction system of claim 77, wherein the first material comprises at least 10 weight percent nickel.

83. The feed vaporization and introduction system of claim 82, wherein the first material comprises at least 30 weight percent nickel.

84. The feed vaporization and introduction system of claim 83, wherein the first material comprises at least 50 weight percent nickel.

85. The feed vaporization and introduction system of claim 84, wherein the first material comprises at least 60 weight percent nickel.

86. The feed vaporization and introduction system of claim 77, wherein the first material comprises at least 2 weight percent aluminum.

87. The feed vaporization and introduction system of claim 86, wherein the first material comprises at least 4 weight percent aluminum.

88. The feed vaporization and introduction system of claim 77, wherein the first material comprises less than 70 weight percent iron.

89. The feed vaporization and introduction system of claim 88, wherein the first material comprises less than 50 weight percent iron.

90. The feed vaporization and introduction system of claim 89, wherein the first material comprises less than 30 weight percent iron.

91. The feed vaporization and introduction system of claim 90, wherein the first material comprises less than 10 weight percent iron.

92. The feed vaporization and introduction system of claim 60, wherein the first material comprises at least 2 weight percent copper.

93. The feed vaporization and introduction system of claim 92, wherein the first material comprises at least 15 weight percent copper.

94. The feed vaporization and introduction system of claim 93, wherein the first material comprises at least 35 weight percent copper.

95. The feed vaporization and introduction system of claim 60, wherein the first material is an alloy selected from the group consisting of 825 and 400.

96. The feed vaporization and introduction system of claim 91, wherein the first material comprises less than 5 weight percent iron.

97. The feed vaporization and introduction system of claim 77, wherein the first material is any material other than carbon steel.

98. The feed vaporization and introduction system of claim 59, wherein the nozzle is jacketed with a cooling system.

99. The feed vaporization and introduction system of claim 59, wherein the nozzle is jacketed with a thermally insulating material.

100. The feed vaporization and introduction system of claim 99, wherein the insulating material is selected from the group consisting of fire brick, high temperature calcium silicate, alumina and silica-alumina ceramics, diatomaceous silica brick and cements, and fillers.

101. The feed vaporization and introduction system of claim 99, wherein the thermally insulating material covers at least a portion of an interior portion of the nozzle extending inside the reactor.

102. The feed vaporization and introduction system of claim 60, wherein the first material is an alloy selected from the group consisting of TD, 758, 625, 601 and 276.

103. The feed vaporization and introduction system of claim 60, wherein the first material is an alloy selected from the group consisting of 693, 602, 690, 671, 617, 263 and 956.